MURRAY WATER WORKS (PWSNO 1400039)
SOURCE WATER ASSESSMENT REPORT

March 5, 2003

State of Idaho
Department of Environmental Quality

Executive Summary

Under the Safe Drinking Water Act Amendments of 1996, all states are required by the U.S. Environmental Protection Agency to assess every source of public drinking water for its relative sensitivity to contaminants regulated by the act. This risk assessment is based on a land use inventory in the well recharge zone, sensitivity factors associated with how the well was constructed, and aquifer characteristics.

This report, *Source Water Assessment for the Murray Water Works*, describes the public drinking water well; the well recharge zone and potential contaminant sites located inside the recharge zone boundaries. This assessment, taken into account with local knowledge and concerns, should be used as a planning tool to develop and implement appropriate protection measures for this public water system. **The results should <u>not be</u> used as an absolute measure of risk and they should <u>not be</u> used to undermine public confidence in the water system.**

Murray Water Works operates a community water system with 22 active connections serving a population of 35 in Shoshone County Idaho (Figure 1). A 245-foot deep well completed in shale supplies drinking water for the community. Historically, the system relied on unfiltered surface water from intakes in Alder Creek, which were disconnected in the fall of 2002. The well produces more than 50 gallons per minute of high quality water, an amount adequate for the community's now that leakage from the distribution system is controlled.

An analysis of the Murray Water Works well conducted by the Idaho Department of Environmental Quality on February 12, 2003 ranked the well moderately susceptible to all classes of regulated contaminants. Risk factors related to local geology added the most points to the final susceptibility scores. Part of the town of Murray lies inside the recharge zone delineated for the well, but other than residential land use and a nearby stream, there are few potential sources of contamination in the vicinity.

This assessment should be used as a basis for determining appropriate new protection measures or re-evaluating existing protection efforts. No matter what ranking a source receives, protection is always important. Whether the source is currently located in a “pristine” area or an area with numerous industrial and/or agricultural land uses that require education and surveillance, the way to ensure good water quality in the future is to act now to protect valuable water supply resources.

Eliminating the surface water source with its associated microbial contamination is a significant improvement for Murray Water Works. But because the well is near Alder Creek, a seasonal stream that flows in spring and early summer, it needs to be evaluated for possible surface water influence. The system also needs to develop a cross connection control program to get rid of unprotected pathways where contaminants can be siphoned into the water system during periods of low pressure. Repairs to the distribution system, parts of which are more than 100 years old, were completed in November 2002.

Systems and water users can contact their regional Department of Environmental Quality office or the Idaho Rural Water Association for assistance with source water protection planning.

SOURCE WATER ASSESSMENT FOR MURRAY WATER WORKS

Section 1. Introduction - Basis for Assessment

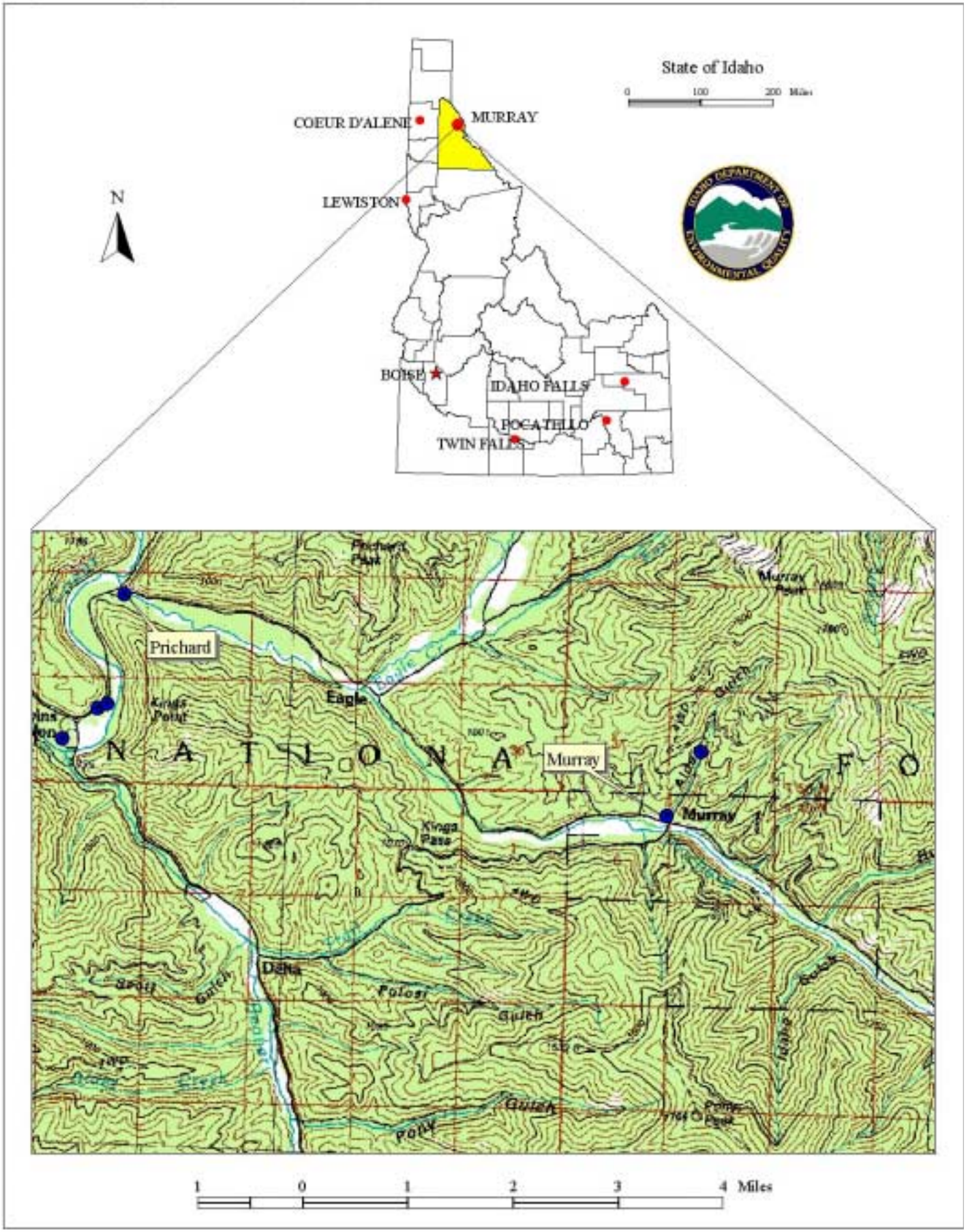
The following sections contain information necessary for understanding how and why this assessment was conducted. **It is important to review this information to understand what the ranking of this source means.** A map showing the delineated source water assessment area and an inventory of significant potential sources of contamination identified within that area are included. The ground water Susceptibility Analysis Worksheet used to develop this assessment is attached.

Level of Accuracy and Purpose of the Assessment

The Idaho Department of Environmental Quality (DEQ) is required by the U.S. Environmental Protection Agency (EPA) to assess every public drinking water source in Idaho for its relative susceptibility to contaminants regulated by the Safe Drinking Water Act. These assessments are based on a land use inventory inside the delineated recharge zones, sensitivity factors associated with how the well is constructed, and aquifer characteristics. The state must complete more than 2900 assessments by May of 2003. Because resources and the time available to accomplish assessments are limited, an in-depth, site-specific investigation for every public water system is not possible.

The results of the source water assessment should <u>not be</u> used as an absolute measure of risk and they should <u>not be</u> used to undermine public confidence in the water system. The ultimate goal of this assessment is to provide data to local communities for developing a protection strategy for their drinking water supply. The Idaho Department of Environmental Quality recognizes that pollution prevention activities generally require less time and money to implement than treating a public water supply system once it has been contaminated. DEQ encourages communities to balance resource protection with economic growth and development. The decision as to the amount and types of information necessary to develop a source water protection program should be determined by the local community based on its own needs and limitations. Wellhead or source water protection is one facet of a comprehensive growth plan, and it can complement ongoing local planning efforts.

Figure 1. Geographic Location of Murray Water Works



Section 2. Preparing for the Assessment

Defining the Zones of Contribution -

The delineation process establishes the physical area around a well that will become the focal point of the assessment. The process includes mapping the boundaries of the well recharge area into time of travel zones indicating the number of years necessary for a particle of water flowing through the aquifer to reach a well. The computer model used data assimilated by DEQ from a variety of sources including the local well logs and pumping volume estimates for the Murray Water Works well.

Murray Water Works operates community water system with 22 active connections serving a population of 35 in Shoshone County Idaho (Figure 1). The system has recently changed ownership, and has disconnected the Alder Creek intakes that formerly supplied unfiltered surface water to the town. Parts of the water distribution system and the Alder Creek intakes probably date from the community's founding more than 100 years ago.

Because few driller's logs are on file for wells in the Murray area, insufficient information is available for analytical ground water flow modeling of the recharge area for the Murray Water Works well. The capture zone was delineated by superposing geological fault data on topographic maps. A fault located upgradient of Murray is the probable recharge source for the well. The fault is located near the topographic boundary of many of the tributaries of Prichard Creek. This fault line and ridge lines define the recharge zone boundaries shown in Figure 2. The estimated time of travel for all water reaching the well is three years or less.

Identifying Potential Sources of Contamination

The goal of the inventory process is to locate and describe those facilities, land uses, and environmental conditions that are potential sources of ground water contamination. Inventories for all public water systems in Idaho were conducted in two-phases. The first phase involved identifying and documenting potential contaminant sources within a system's source water assessment area through the use of computer databases and Geographic Information System maps developed by DEQ. Maps showing the delineations and tables summarizing the results of the database search were then sent to system operators for review and correction during the second or enhanced phase of the inventory process. Information from the public water system file was also incorporated into the potential contaminant inventory.

Many potential sources of contamination are regulated at the federal level, state level, or both to reduce the risk of release. When a business, facility, or property is identified as a potential contaminant source, this should not be interpreted to mean that this business, facility, or property is in violation of any local, state, or federal environmental law or regulation. What it does mean is that the potential for contamination exists due to the nature of the business, industry, or operation.

Section 3. Susceptibility Analysis

The susceptibility to contamination of all ground water sources in Idaho is being assessed on the following factors:

- physical integrity of the well,
- hydrologic characteristics,
- land use characteristics, and potentially significant contaminant sources
- historic water quality

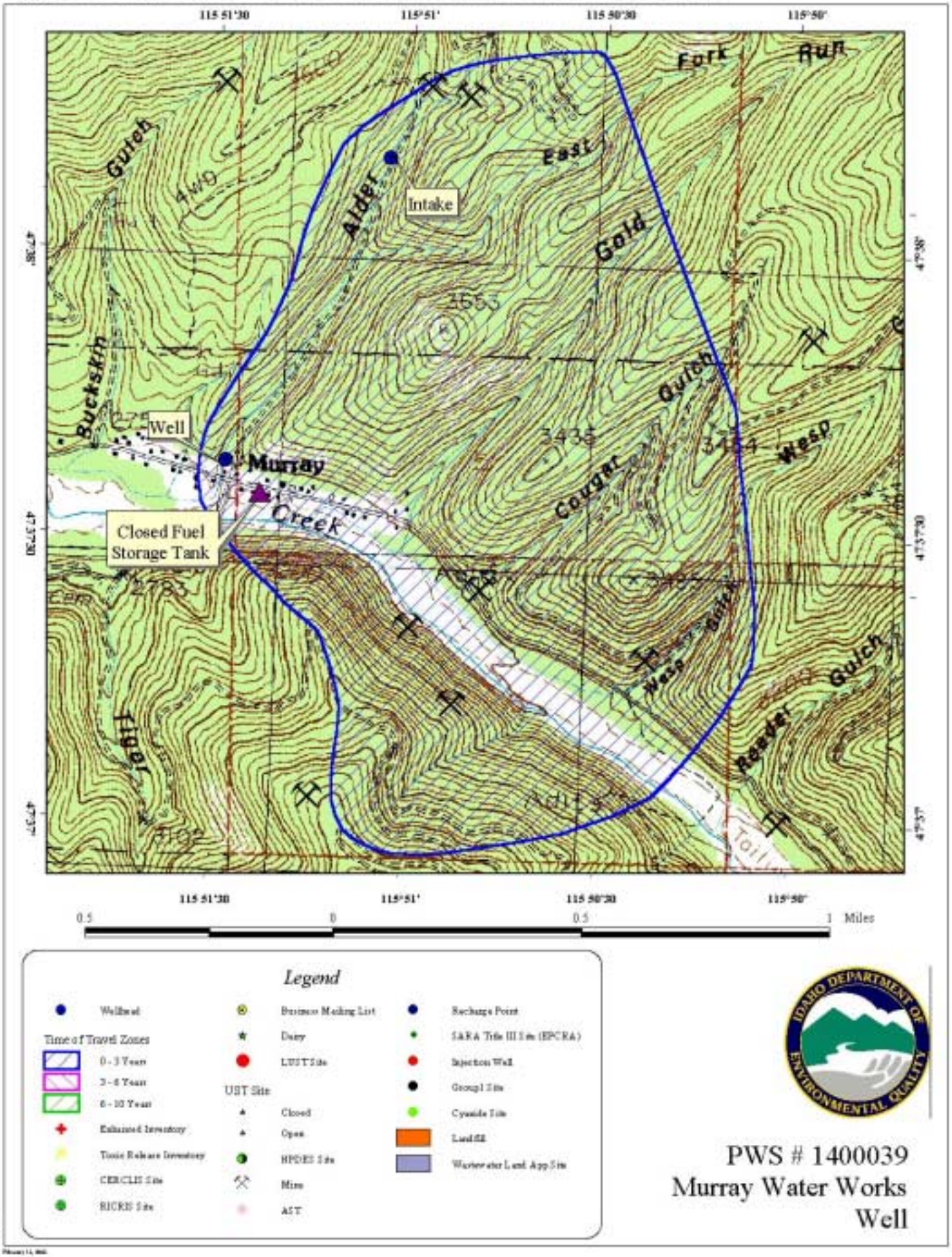
The susceptibility rankings are specific to a particular potential contaminant or category of contaminants. A high susceptibility rating relative to one potential contaminant does not mean that the water system is at the same risk for all other potential contaminants. The relative ranking that is derived for each well is a qualitative, screening-level step that, in many cases, uses generalized assumptions and best professional judgement. The following summaries describe the rationale for the susceptibility ranking. The Susceptibility Analysis Worksheet for the Murray Water Works well, Attachment A, shows in detail how the well was scored.

Well Construction

Well construction directly affects the ability of the wells to protect the aquifer from contaminants. Lower scores imply a well that can better protect the water. This portion of the susceptibility analysis relies on information from individual well logs and from the most recent sanitary survey of the public water system. The Murray Water Works well log is on file with DEQ. While several maintenance deficiencies were noted during a sanitary survey in May 2001, none pertained to the wellhead and surface seal.

The Murray well was drilled in 1993 to a depth of 245 feet. The 6-inch steel casing extends from a foot above ground to 34 feet below where it terminates at the interface between broken and solid shale. The remainder of the well bore is free standing in the shale bedrock. The bentonite clay surface seal is also 34 feet deep. Static water level in the well is 20 feet below land surface. Air testing at the time of drilling produced a discharge of more than 50 gallons per minute. Except for a minor difference in the casing wall thickness and height of the casing above grade, the well meets current Idaho Department of Water Resources well construction standards. Because the well is located within 50 feet of Alder Creek, it needs to be evaluated for possible surface water influence.

Figure 2. Murray Water Works Delineation and Potential Contaminant Inventory.



Hydrologic Sensitivity

Hydrologic sensitivity scores reflect natural geologic conditions at the well site and in the recharge zone. Information for this part of the analysis is derived from individual well logs and from the soil drainage classification inside the delineation boundaries. The Murray Water Works well scored 5 points out of 6 points possible in the hydrologic sensitivity portion of the susceptibility analysis. Soils in the recharge zone generally are moderately well to well drained. Rapidly draining soils like these are deemed less protective of ground water than soils that drain slowly. At the well site, 20 feet of clay and gravel and 14 feet of fractured shale cover the underlying bedrock. When it is mixed with coarse material like gravel, the clay does not reliably provide an impervious barrier against vertical transport of contaminants. Water was first encountered in a seam of soft shale 125 to 130 feet below the surface.

Potential Contaminant Sources and Land Use

Figure 2, *Murray Water Works Delineation and Potential Contaminant Inventory* on page 7 shows the location of the Murray Water Works well, and the zone of contribution DEQ delineated for it. About half of the town of Murray is inside the recharge zone for the well. The locations of septic tanks relative to the well are not documented in the public water system file for Murray Water Works. Bulk fuel was formerly stored at the county barn about 160 yards southeast of the well. Partially logged wooded hillsides with several abandoned mines cover the delineated area outside of town. Naturally occurring mineralization may be a non-point source of inorganic chemical contaminants. Mines in the delineated area were very small to small producers of gold, lead, zinc, tungsten and arsenic. None of them had milling facilities. The potential chemical hazard to humans for these mines, as ranked in the Interior Columbia Basin Ecosystem Management Project *Mining Related Hazard Potential* database , ranges from 8 to 23 on a scale of 0 to 99, with 99 representing the greatest threat.

Historic Water Quality

Murray Water Works has had few water quality problems other than the sporadic presence of total coliform bacteria in monthly samples. In the period from January 1998 through January 2003, tests for total coliform bacteria were positive in August and September 1998 and September 2001. The Alder Creek source was in use until November 2002. Chlorination was provided at the reservoirs. The well is plumbed to its own pressure tanks and is not chlorinated. Chemical and radiological sampling results for the Murray well are summarized on the table below.

Table 1. Murray Water Works Chemical Sampling Results

Primary IOC Contaminants (Mandatory Tests)							
Contaminant	MCL (mg/l)	Results (mg/l)	Dates	Contaminant	MCL (mg/l)	Results (mg/l)	Dates
Antimony	0.006	ND	12/28/95, 7/12/02	Nitrate	10	ND to 0.025	10/14/93 to 7/12/02
Arsenic	0.01	ND	12/28/95, 7/12/02	Nickel	N/A	ND	12/28/95, 7/12/02
Barium	2.0	ND, 0.058	12/28/95, 7/12/02	Selenium	0.05	ND	12/28/95, 7/12/02
Beryllium	0.004	ND	12/28/95, 7/12/02	Sodium	N/A	8.37, 39.4	12/28/95, 7/12/02
Cadmium	0.005	ND	12/28/95, 7/12/02	Thallium	0.002	ND	12/28/95, 7/12/02
Chromium	0.1	ND	12/28/95, 7/12/02	Cyanide	0.02	ND	12/28/95
Mercury	0.002	ND	12/28/95, 7/12/02	Fluoride	4.0	ND, 1.1	12/28/95, 7/12/02

Table 1. Murray Water Works Chemical Sampling Results continued

Secondary and Other IOC Contaminants (Optional Tests)			
Contaminant	Recommended Maximum (mg/l)	Results (mg/l)	Dates
Iron	0.3	1.46	6/4/98
Manganese	0.05	0.38	6/4/98
Sulfate	250	13.0	12/28/95

Regulated and Unregulated Synthetic Organic Chemicals		
Contaminant	Results	Dates
29 Regulated and 13 Unregulated Synthetic Organic Compounds	None Detected	10/14/93, 7/12/02

Regulated and Unregulated Volatile Organic Chemicals		
Contaminant	Results	Dates
21 Regulated And 16 Unregulated Volatile Organic Compounds	None Detected	10/14/93, 7/12/02

Radiological Contaminants			
Contaminant	MCL	Results	Dates
Gross Alpha, Including Ra & U	15 pCi/l	3.1 pCi/l	8/10/99
Gross Beta Particle Activity	4 mrem/year	1.5 mrem	8/10/1999

Final Susceptibility Ranking

The Murray Water Works well is moderately susceptible to all classes of regulated contaminants mostly because of risk factors related to the well site geology. The well recharge zone is predominantly undeveloped except for abandoned mines and logging activity. The well itself appears to be adequately constructed with a production capacity large enough to supply water for the community. Total scores for system construction and hydrologic sensitivity along with the cumulative scores for land use and potential contaminant sites are shown on Table 2. The complete Susceptibility Analysis Worksheet for the Murray Water Works well can be found in Attachment A.

The final scores for the susceptibility analysis were determined using the following formulas:

1) VOC/SOC/IOC Final Score = Hydrologic Sensitivity + System Construction + (Potential Contaminant/Land Use x 0.2)
2) Microbial Final Score = Hydrologic Sensitivity + System Construction + (Potential Contaminant/Land Use x 0.35)

The final ranking categories are as follows:

- 0 - 5 Low Susceptibility
- 6 - 12 Moderate Susceptibility
- > 13 High Susceptibility

Table 2. Summary of Murray Water Works Susceptibility Evaluation

Cumulative Susceptibility Scores						
Well Name	System Construction 0-6 possible	Hydrologic Sensitivity 0-6 possible	Contaminant Inventory plus Land Use			
			IOC 0-30 possible	**VOC** 0-30 possible	**SOC** 0-30 possible	**Microbial** 0-14 possible
Well #1	1	5	5	5	5	4

Final Susceptibility Scores/Ranking				
Well Name	IOC 0-18 possible	VOC 0-18 possible	SOC 0-18 possible	Microbial 0-15 possible
Well #1	7/Moderate	7/Moderate	7/Moderate	7/Moderate

Low numbers are favorable because high scores indicate increased susceptibility to contaminants
IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical

Section 4. Options for Source Water Protection

The susceptibility assessment should be used as a basis for determining appropriate new protection measures or re-evaluating existing protection efforts. No matter what the susceptibility ranking a source receives, protection is always important. Whether the source is currently located in a "pristine" area or an area with numerous industrial and/or agricultural land uses that require education and surveillance, the way to ensure good water quality in the future is to act now to protect valuable water supply resources.

Eliminating the surface water source with its associated microbial contamination is a significant improvement for Murray Water Works. But because the well is near Alder Creek, a seasonal stream that flows in spring and early summer, it needs to be evaluated for possible surface water influence. Repairs to the distribution were completed in November 2002, reducing leakage and breaks where contaminants could enter the drinking water supply. The system also needs to develop a cross connection control program to get rid of unprotected pathways where contaminants can be siphoned into the water system during periods of low pressure.

It might be helpful to distribute public education materials related to cross connection control with water bills. Septic system maintenance is another important topic in areas like Murray where there is no municipal sewage treatment. The Water Works could sponsor household hazardous waste collection days to encourage disposal methods other than dumping or flushing these potential contaminants.

A voluntary measure every system should implement is development of a water emergency response plan. There is a simple fill-in-the-blanks form available on the DEQ website to guide systems through the process.

Assistance

Public water suppliers and users may call the following IDEQ offices with questions about this assessment and to request assistance with local drinking water protection planning. In addition, draft protection plans may be submitted to the IDEQ office for preliminary review and comments. Water suppliers serving fewer than 10,000 persons may contact Melinda Harper of the Idaho Rural Water Association (208) 343-7001for assistance with drinking water protection strategies.

Idaho Department of Environmental Quality	
Coeur d'Alene Regional IDEQ Office	(208) 769-1422
State IDEQ Office, Boise	(208) 373-0502
Website:	http://www.deq.state.id.us/water
Idaho Rural Water Association	
Melinda Harper, Groundwater Protection Specialist	(800) 962-3257
Website:	http://www.idahoruralwater.com
Idaho Association of Soil Conservation Associations	
Water quality and soil conservation	(208) 338-5900
Website:	http://www.iascd.state.id.us/

References Cited

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Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers, 1997. "Recommended Standards for Water Works."

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Idaho Division of Environmental Quality, 1999, Idaho Source Water Assessment Plan, October, 39 p.

Idaho Division of Environmental Quality, 1997, Idaho Wellhead Protection Plan, Idaho Wellhead Protection Work Group, February.

Idaho Department of Water Resources, 1993. Administrative Rules of the Idaho Water Resource Board: Well Construction Standards Rules. IDAPA 37.03.09.

Theis, C.V., 1935, The Relation between Lowering of the Piezometric Surface and the Rate and Duration of Discharge of a Well Using Groundwater Storage, Trans. Amer. Geophysical Union, v. 16, pp. 519-524.

Attachment A

Murray Water Works Susceptibility Analysis Worksheet

Ground Water Susceptibility

Public Water System Name : **MURRAY WATER WORKS** Source: **WELL**

Public Water System Number : **1400039** 2/12/03 1:41:48 PM

1. System Construction		SCORE			
Drill Date	7/28/93				
Driller Log Available	YES				
Sanitary Survey (if yes, indicate date of last survey)	YES 2001				
Well meets IDWR construction standards	YES	0			
Wellhead and surface seal maintained	YES	0			
Casing and annular seal extend to low permeability unit	YES	0			
Highest production 100 feet below static water level	YES	0			
Well located outside the 100 year flood plain	NO	1			
Total System Construction Score		**1**			
2. Hydrologic Sensitivity					
Soils are poorly to moderately drained	NO	2			
Vadose zone composed of gravel, fractured rock or unknown	NO	0			
Depth to first water > 300 feet	NO	1			
Aquitard present with > 50 feet cumulative thickness	NO	2			
Total Hydrologic Score		**5**			
		IOC	VOC	SOC	Microbial
3. Potential Contaminant / Land Use - ZONE 1A (Sanitary Setback)		Score	Score	Score	Score
Land Use Zone 1A	RESIDENTIAL	2	2	2	2
Farm chemical use high	NO	0	0	0	
IOC, VOC, SOC, or Microbial sources in Sanitary Setback	NO	NO	NO	NO	NO
Total Potential Contaminant Source/Land Use Score - Zone 1A		**2**	**2**	**2**	**2**
Potential Contaminant / Land Use - ZONE 1B (3 YR. TOT)					
Contaminant sources present (Number of Sources)	YES Surface Water, Mines, closed bulk fuel storage tank	1	1	1	1
(Score = # Sources X 2) 8 Points Maximum		2	2	2	2
Sources of Class II or III leacheable contaminants or Microbials	YES	1	1	1	
4 Points Maximum		1	0	0	
Zone 1B contains or intercepts a Group 1 Area	NO	0	0	0	0
Land use Zone 1B	Less Than 25% Agricultural Land	0	0	0	0
Total Potential Contaminant Source / Land Use Score - Zone 1B		**3**	**3**	**3**	**2**
Cumulative Potential Contaminant / Land Use Score		**5**	**5**	**5**	**4**
4. Final Susceptibility Source Score		**7**	**7**	**7**	**7**
5. Final Well Ranking		Moderate	Moderate	Moderate	Moderate

POTENTIAL CONTAMINANT INVENTORY
LIST OF ACRONYMS AND DEFINITIONS

AST (Aboveground Storage Tanks) – Sites with aboveground storage tanks.

Business Mailing List – This list contains potential contaminant sites identified through a yellow pages database search of standard industry codes (SIC).

CERCLIS – This includes sites considered for listing under the **Comprehensive Environmental Response Compensation and Liability Act (CERCLA)**. CERCLA, more commonly known as Superfund is designed to clean up hazardous waste sites that are on the national priority list (NPL).

Cyanide Site – DEQ permitted and known historical sites/facilities using cyanide.

Dairy – Sites included in the primary contaminant source inventory represent those facilities regulated by Idaho State Department of Agriculture (ISDA) and may range from a few head to several thousand head of milking cows.

Deep Injection Well – Injection wells regulated under the Idaho Department of Water Resources generally for the disposal of stormwater runoff or agricultural field drainage.

Enhanced Inventory – Enhanced inventory locations are potential contaminant source sites added by the water system. These can include new sites not captured during the primary contaminant inventory, or corrected locations for sites not properly located during the primary contaminant inventory. Enhanced inventory sites can also include miscellaneous sites added by the Idaho Department of Environmental Quality (DEQ) during the primary contaminant inventory.

Floodplain – This is a coverage of the 100year floodplains.

Group 1 Sites – These are sites that show elevated levels of contaminants and are not within the priority one areas.

Inorganic Priority Area – Priority one areas where greater than 25% of the wells/springs show constituents higher than primary standards or other health standards.

Landfill – Areas of open and closed municipal and non-municipal landfills.

LUST (Leaking Underground Storage Tank) – Potential contaminant source sites associated with leaking underground storage tanks as regulated under RCRA.

Mines and Quarries – Mines and quarries permitted through the Idaho Department of Lands.)

Nitrate Priority Area – Area where greater than 25% of wells/springs show nitrate values above 5mg/l.

NPDES (National Pollutant Discharge Elimination System) – Sites with NPDES permits. The Clean Water Act requires that any discharge of a pollutant to waters of the United States from a point source must be authorized by an NPDES permit.

Organic Priority Areas – These are any areas where greater than 25 % of wells/springs show levels greater than 1% of the primary standard or other health standards.

Recharge Point – This includes active, proposed, and possible recharge sites on the Snake River Plain.

RICRIS – Site regulated under **Resource Conservation Recovery Act (RCRA)**. RCRA is commonly associated with the cradle to grave management approach for generation, storage, and disposal of hazardous wastes.

SARA Tier II (Superfund Amendments and Reauthorization Act Tier II Facilities) – These sites store certain types and amounts of hazardous materials and must be identified under the Community Right to Know Act.

Toxic Release Inventory (TRI) – The toxic release inventory list was developed as part of the Emergency Planning and Community Right to Know (Community Right to Know) Act passed in 1986. The Community Right to Know Act requires the reporting of any release of a chemical found on the TRI list.

UST (Underground Storage Tank) – Potential contaminant source sites associated with underground storage tanks regulated as regulated under RCRA.

Wastewater Land Applications Sites – These are areas where the land application of municipal or industrial wastewater is permitted by DEQ.

Wellheads – These are drinking water well locations regulated under the Safe Drinking Water Act. They are not treated as potential contaminant sources.

NOTE: Many of the potential contaminant sources were located using a geocoding program where mailing addresses are used to locate a facility. Field verification of potential contaminant sources is an important element of an enhanced inventory.

Where possible, a list of potential contaminant sites unable to be located with geocoding will be provided to water systems to determine if the potential contaminant sources are located within the source water assessment area.